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(56) Documents Cited
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UK CL (Edition T) B1T TNDX TPDX
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(54) Abstract Title
Removal of filtered dust by an air stream

(57) An aspirating device 1 for combustion air 2 in an internal combustion engine 3 comprises an air filter 5 to clean the combustion air 2 entering the filter 5 via an opening 6 in a filter housing 7 to a dirty chamber 14 and means for removal of the dust collected from the combustion air 2 by a carrier air stream 10 provided on the side of the dirty chamber 14. Preferably the carrier air stream 10 is generated by an axial or radial type fan 9 located at an end of a flow channel 15 and removes the dust dislodged from the filter 5 by inertia forces during operation of the engine and which has fallen into the discharge pipe 13 due to gravitational forces. Advantageously the aspirating device 1 is suitable for manually operated tools having an internal combustion engine such as a grinder 4 and a motor saw which operate in a dusty environment.

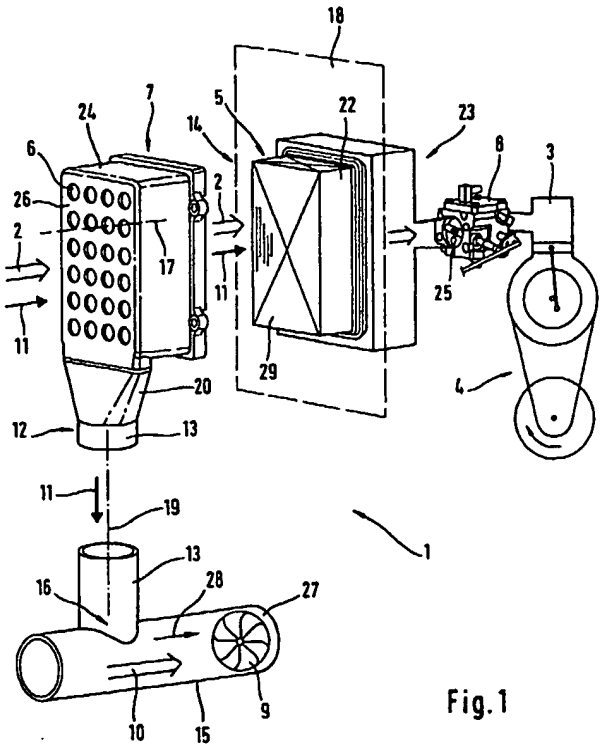

Fig.1

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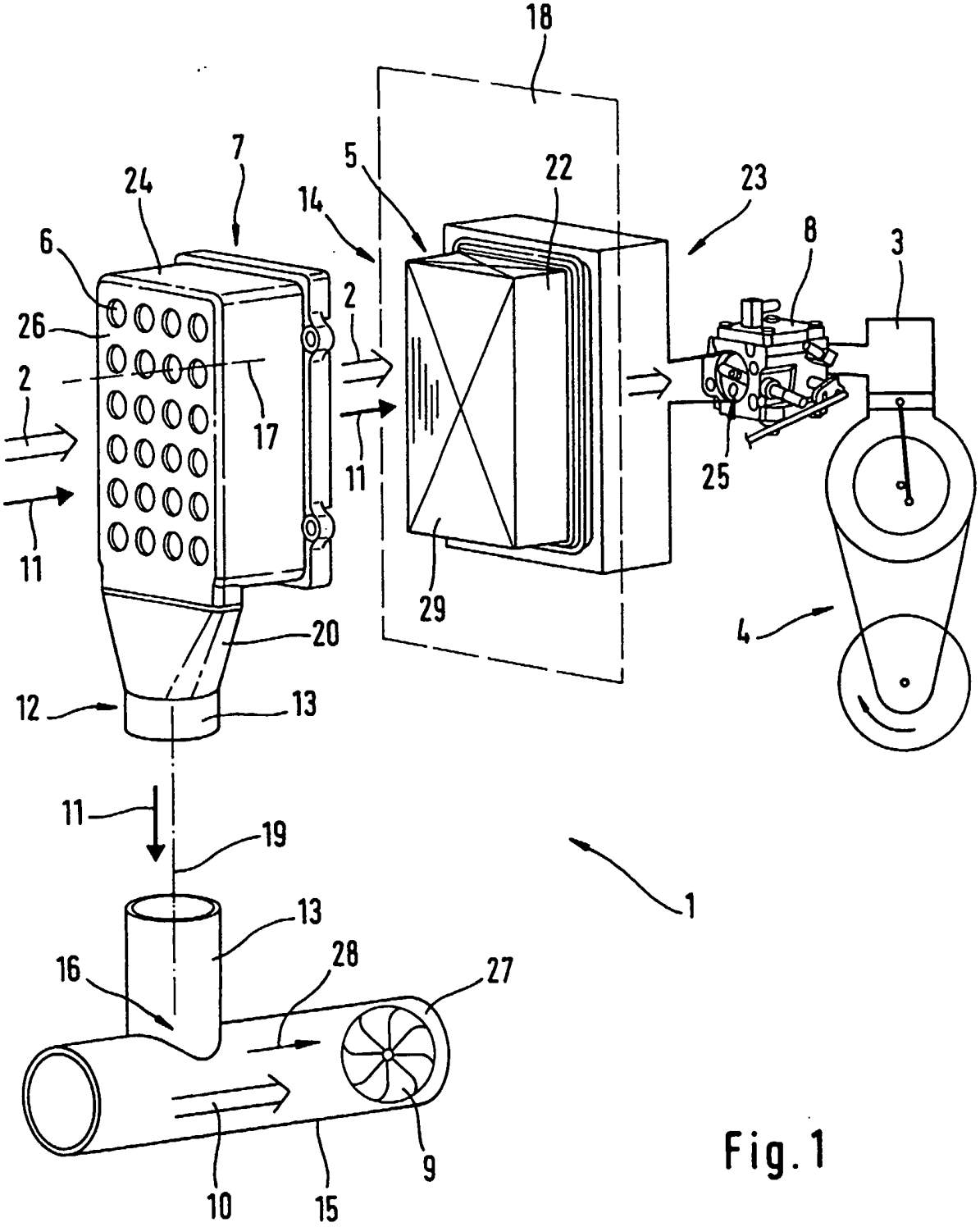
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Fig. 1

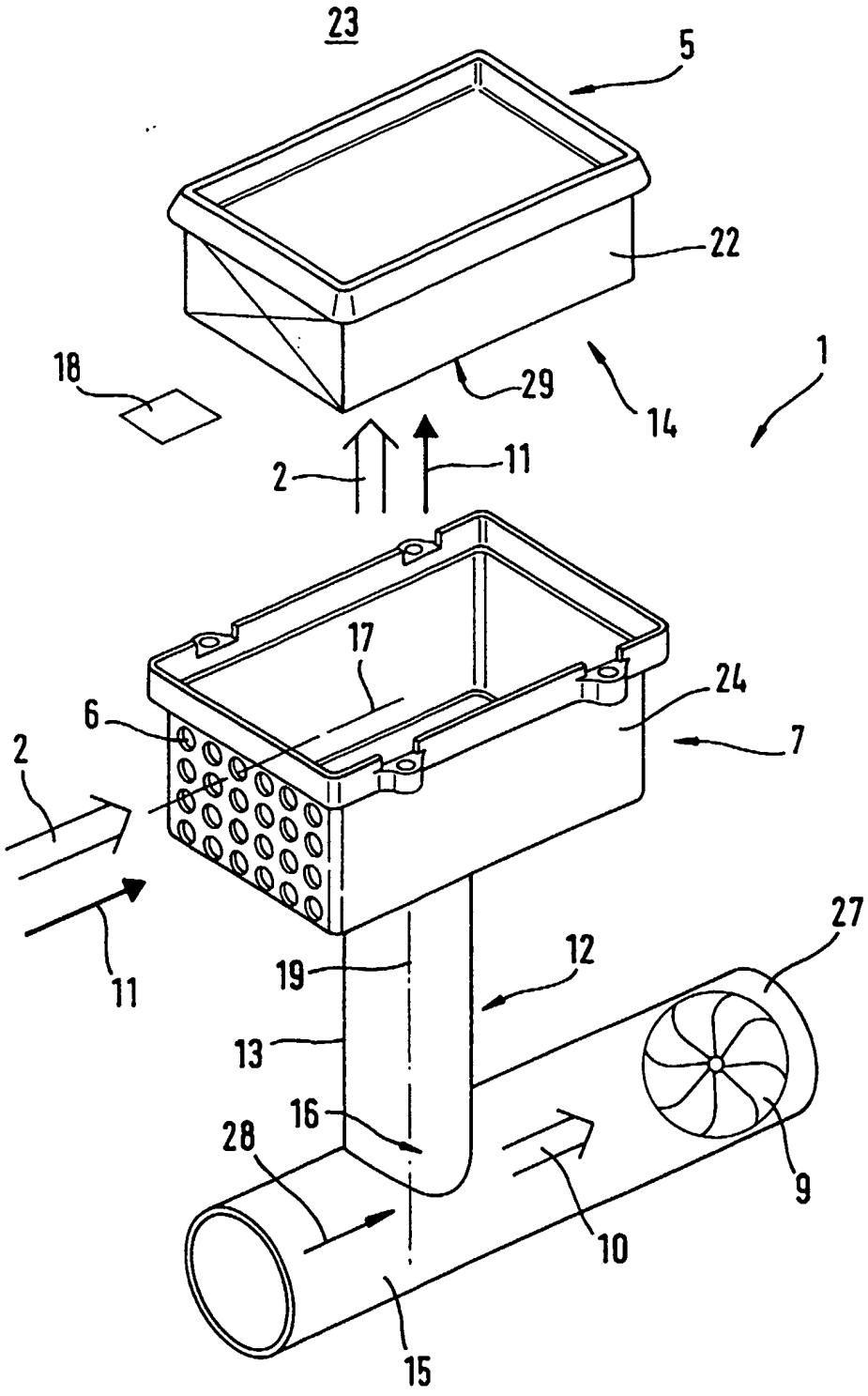

Fig. 2

An aspirating device for combustion air

The invention relates to an aspirating device for the combustion air in an internal combustion engine in particular but not exclusively for the internal combustion engine in a manually operated tool such as a parting-off grinder, a motor saw or similar.

DE 44 35 430 describes an aspirating device for an internal combustion engine in a manually operated tool in which an air filter in a filter housing is provided to clean the combustion air. Unfiltered air is conveyed through an opening into the filter housing and along the air filter by the cooling fan of the internal combustion engine. The carburettor of the internal combustion engine, which aspirates combustion air into a combustion chamber in the internal combustion engine through an air filter, is connected on the clean air side of the filter housing. Particularly when the air in the operating environment of the tool is very dirty, as is often the case with parting-off grinders, for example, the dust contained in the air collects on the air filter, rapidly clogging it and thereby adversely affecting the power development of the internal combustion engine. Due to the high dust load, the air filter requires frequent cleaning and the operation of the internal combustion engine requires intensive maintenance.

The present invention seeks to specify an aspirating device for the combustion air in an internal combustion engine which allows low maintenance continuous operation of the internal combustion engine with a minimised dust load even when the air in the operating environment of the tool is very dirty.

According to the present invention there is provided an aspirating device for the combustion air in an internal combustion engine, with an air filter to clean the combustion air entering the air filter via an opening in a filter housing in a dirty chamber of the air filter of the dirt it is carrying, the combustion air being aspirated by the internal combustion engine, wherein, the aspirating device has means for the removal of the dust collected from the combustion air in a carrier air stream on the side of the dirty chamber.

In the aspirating device means are provided on the side of the dirty chamber to remove the dust separated from the combustion air using a carrier air stream. The dust load of the air filter is thus reduced and continuous diversion of the dust separated at the air filter guaranteed. The combustion air for the internal combustion engine flows initially through an opening in the filter housing into a dirty chamber, the dirty chamber being bounded by the filter housing and the filter. The combustion air is fed through the air filter where dust is separated out and then passes through a section of the induction pipe in the carburettor of the internal combustion engine into a crankcase and a combustion chamber in the internal combustion engine. A discharge pipe connected to the dirty chamber connects the dirty chamber of the filter housing to a flow channel. The flow channel carries the carrier air stream. If dust falls from the air filter while the tool is in operation, it passes into the discharge pipe and is removed by the carrier air stream. The flow channel is positioned generally at right angles to the discharge pipe. This creates static pressure or under-pressure in the mouth area in which the discharge pipe opens out into the flow channel which supports the removal of the filter cake or dust from the dirty chamber and the discharge pipe. It may be useful for the discharge pipe to open into the flow channel at an acute angle. This design feature reinforces the suction effect of the carrier air stream into the discharge pipe.

The geometrical arrangement of the direction of flow of the combustion air in the filter housing in relation to the discharge pipe is selected such that the combustion air passes through the dirty chamber of the filter housing in such a away that it runs at least at right angles to the discharge pipe, and preferably in the opposite direction to the direction of conveyance of the dust or filter cake in the discharge pipe. To this end the longitudinal centre line of the opening for the intake of combustion air is positioned generally at right angles to the discharge pipe. In order to keep coarse particles of dirt out of the dirty chamber of the filter housing, it is useful to provide a multitude of openings rather than just one opening for the intake of combustion air. The diameter or cross-section area thereof may be comparatively smaller than that of a single opening.

The air filter preferably takes the form of a flat structure with a rectangular, quadratic, circular or polygonal footprint. It forms a filter plane which is aligned in

parallel with or generally vertical in relation to the longitudinal centre line of the discharge pipe.

The discharge pipe, which is positioned generally vertically – i.e. pointing towards the centre of the earth – when the tool is in the operating position, opens out into the filter housing, broadening in a funnel-shape beneath the air filter. Thus it is possible for any dust or filter cake falling from the air filter to pass into the discharge pipe as a result of gravitational forces.

The fan which generates the carrier air stream is preferably a cooling fan in the internal combustion engine. The filter is preferably a flat or folded paper filter.

An embodiment of the invention is illustrated in the drawing and described in detail below.

Fig. 1 shows an exploded schematic view of an aspirating device.

Fig. 2 shows a view of a further aspirating device.

Fig. 1 shows a schematic view of an aspirating device 1 for the combustion air 2 in an internal combustion engine 3. The internal combustion engine 3 serves to drive a schematically illustrated, manually operated tool 4 – in the embodiment a parting-off grinder. The internal combustion engine 3 is also suitable for driving other manually operated tools such as chain saws, a rotary cutters, etc.

The aspirating device 1 shown is particularly advantageous for tools which operate in environments in which large quantities of dirt such as air-borne dust 11, etc. occur, as is the case with the use of parting-off grinders in road building, for example. In such cases, the combustion air for the internal combustion engines in these types of tools has to be cleaned of dust 11. The dust 11 in the combustion air 2 aspirated by the tool 4 must be removed from the tool 4 either constantly or at intervals. To this end, the aspirating device 1 is provided with an air filter 5 which is usefully designed as a flat or folded paper filter 22. The air filter 5 is located in a filter housing 7, said filter housing 7

being divided into a dirty chamber 14 and a clean chamber 23 by the air filter 5. On the dirty chamber side, the air filter 5 is surrounded on all sides by a trough-shaped filter housing cover 24. On the clean chamber side opposite the dirty chamber 14, the air filter 5 is connected to a housing of a carburettor 8, in particular to an induction pipe 25 formed in the carburettor 8. The wall 26 of the filter housing cover 24 opposite the air filter 5 has four rows of openings 6 for the intake of uncleaned, dust-laden combustion air 2.

When the internal combustion engine 3 is in operation, the combustion air 2 is cleaned by the air filter 5 and – enriched with fuel - flows through the induction pipe 25 into a crankcase and a combustion chamber in the internal combustion engine 3. The flow of combustion air is created predominantly by the pressure fluctuations generated by a moving rotary or reciprocating piston in the internal combustion engine 3.

While the internal combustion engine 3 is in operation, dust 11 collects on the dirty chamber side 14 of the air filter 5 and after a certain period of operation of the internal combustion engine 3 forms a layer of dust or filter cake. Particularly in the case of tools which are operated in a particularly dust-laden environment, considerable amounts of dust can collect on the air filter 5 in a short space of time. The dust which collects or the filter cake which forms must therefore be removed from the dirty chamber 14 in the filter housing cover 24 and disposed of either continuously or at intervals. As Fig. 2 which shows a schematic view of a further aspirating device 1 illustrates, a carrier air stream which runs along a flow channel 15 a certain distance from the filter housing 7 is provided for this purpose. The carrier air stream 10 is generated by a fan 9 at one end of the flow channel. In Figs. 1 and 2 it is an axial fan positioned in the flow channel 15. It may be useful to use a radial fan instead of an axial fan. It is also useful to use a cooling fan in the internal combustion engine 3 to generate the carrier air stream 10. To remove dust from the filter housing 7, in particular from the filter housing cover 24 into the carrier air stream 10 in the flow channel 15, a discharge pipe 13 is provided to make a fluid connection between the dirty chamber side 14 of the filter housing 7 and the flow channel 15. Said discharge pipe 13 runs generally at right angles to the carrier air stream 10 at least at the mouth area 16 of the discharge pipe 13. It may be useful to position the mouth area 16 of the discharge pipe 10 which opens out

into the flow channel 15 at an acute angle to the flow channel 15 in the direction of flow 28 of the carrier air stream 10. This causes static pressure or under-pressure in the mouth area 16 of the discharge pipe 13.

When the tool 4 is in the operating position, the longitudinal centre line 19 of the discharge pipe 13 is aligned generally vertically, i.e. parallel to the direction of the gravitational force to the centre of the earth. It is useful to design one wall 20 of the filter housing 7, in particular of the filter housing cover 24, so that it tapers in a funnel-shape towards the discharge pipe 13. This causes any dust 11 adhering to the air filter 5 to become dislodged as a result of inertia forces while the tool is in operation and to fall into the discharge pipe 13 as a result of gravitational forces.

As shown in Figs. 1 and 2, the longitudinal centre line 17 of an opening 6 which allows the intake of combustion air 2 at the filter housing cover 24 is positioned generally at right angles to the discharge pipe 13. This causes the fluid flows of combustion air 2 in the filter housing 7 and dust 11 in the discharge pipe 13 to run in separate directions.

In the embodiments illustrated, the air filter 5 is a flat structure which forms a filter plane 18 with its projection surface 29 on the dirty chamber side. In Fig. 1, the air filter 5 is fitted in the filter housing 7 in such a manner in relation to the discharge pipe 13 that the longitudinal centre line 19 of the discharge pipe 13 is generally parallel to the filter plane 18. In Fig. 2, on the other hand, the air filter 5 is fitted in such a way in relation to the discharge pipe 13 that the longitudinal centre line 19 of the discharge pipe 13 is aligned generally vertical to the filter plane 18. In Fig. 2, on its way from the dirty chamber through the air filter 5 in the filter housing 7, the combustion air 2 is therefore diverted by some 90° and the direction of flow of the combustion air 2 on the dirty chamber side is therefore opposite to the direction in which the dust 11 or the filter cake falls into the discharge pipe 13.

Claims

1. An aspirating device for the combustion air in an internal combustion engine, with an air filter to clean the combustion air entering the air filter via an opening in a filter housing in a dirty chamber of the air filter of the dirt it is carrying, the combustion air being aspirated by the internal combustion engine, wherein, the aspirating device has means for the removal of the dust collected from the combustion air in a carrier air stream on the side of the dirty chamber.

2. An aspirating device in accordance with claim 1, wherein, the dirty chamber is connected via a discharge pipe to the carrier air stream which is spatially separate from the combustion air, the carrier air stream passing along a flow channel and running generally at right angles to the discharge pipe in the flow channel at the mouth area of the discharge pipe.

3. An aspirating device in accordance with claim 1 or 2, wherein, the longitudinal central line of the opening 6 for the intake of combustion air runs generally at right angles to the discharge pipe.

4. An aspirating device in accordance with any one of claims 1 to 3, wherein, the filter housing has a plurality of openings for the intake of combustion air.

5. An aspirating device in accordance with any one of claims 1 to 4, wherein, the air filter is a flat structure and forms a filter plane.

6. An aspirating device in accordance with claim 5, wherein the longitudinal centre line of the discharge pipe is aligned generally parallel to the filter plane.

7. An aspirating device in accordance with claim 5, wherein the longitudinal centre line of the discharge pipe is aligned generally vertically in relation to the filter plane.

8. An aspirating device in accordance with any one of claims 2 to 7, wherein, a wall of the filter housing at which the discharge pipe is connected tapers in a funnel shape towards the discharge pipe.

9. An aspirating device in accordance with any one of claims 1 to 8, wherein, the fan is a cooling fan in the internal combustion engine.

10. An aspirating device in accordance with one of claims 2 to 9, wherein, when the tool is in the operating position, the discharge pipe is positioned generally vertically and dust adhering to the air filter is fed into the discharge pipe as a result of gravity.

11. An aspirating device in accordance with any one of claims 1 to 10, wherein the air filter is a flat or folded paper filter.

12. An aspirating device for the combustion air in an internal combustion engine, substantially as described herein with reference to and as illustrated in the accompanying drawings.

Application No: GB 0213138.1
Claims searched: 1 - 12

Examiner: Beverley Lloyd
Date of search: 4 November 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): B1T (TNDX, TPDX)

Int Cl (Ed.7): F02M 35/08

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	US 3884658 A	(PALL) See Figs 1 - 3, col 7, lines 4 - 28	1 - 4
X	US 3838675 A	(SCHAEFFER) See Figs 1 ,3 & 4; col 2, line 47 - 53; col 4, lines 23 - 37	1

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
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